

Photosynth Res (2009) 100:117–119  
DOI 10.1007/s11120-009-9449-8

## HISTORICAL

# Celebrating Achim Trebst's 80th birthday

Volker ter Meulen · Rudolf K. Thauer

© The Author(s) 2009. This article is published with open access at [Springerlink.com](http://Springerlink.com)

**Abstract** At the invitation of Govindjee, we reprint here the English translation of the letter, in German, that we sent, on behalf of the Senate and the Presidium as well as the members of the German Academy of Sciences Leopoldina, from Halle (Saale), to Professor Dr. Dr. h.c.mult. Achim Trebst on his 80th birthday. The original of this letter written in German will appear in Jahrbuch 2009, Deutsche Akademie der Naturforscher Leopoldina, Halle (Saale), Wissenschaftliche Verlagsgesellschaft mbH Stuttgart.

**Keywords** Otto Warburg · DBMIB · Artificial energy conservation · Herbicides · Singlet oxygen · Trebst-Tsujimoto-Arnon experiment · Light and dark phases of photosynthesis · Inhibitors of photosynthesis

## The letter to Achim Trebst

Dear Professor Trebst,

On June 9, you will celebrate your 80th birthday. On behalf of the Senate and the Presidium as well as the members of the German Academy of Sciences Leopoldina, we sincerely congratulate you and wish you all the best for the coming years. The Leopoldina is proud to have counted you as one of the most prominent contemporary scientists shaping photosynthesis research at the national and international levels.

---

V. ter Meulen  
Institute for Virology and Immunobiology, University  
Würzburg, Versbacher Str. 7, 97078 Würzburg, Germany

R. K. Thauer (✉)  
Max Planck Institute for Terrestrial Microbiology,  
Karl-von-Frisch-Str, 35043 Marburg, Germany  
e-mail: [thauer@mpi-marburg.mpg.de](mailto:thauer@mpi-marburg.mpg.de)

Born in 1929 in Zeitz and raised in Hanau, you completed your Abitur (German university entrance qualification) in 1946 in Büdingen, and then completed a pharmacist internship in Gelnhausen. After your pharmaceutical preliminary examination in 1949, you transferred to the University of Heidelberg and began to study chemistry, joining the research group of Friedrich Weygand, in which you completed your diploma thesis (1953), your doctoral thesis (1955), and your first post-doctoral work (1956), whereupon you moved with the Weygand group from Heidelberg to Tübingen (1953) and from there to Berlin (1955). Together with F. Weygand and Adolf Wacker, you carried out research during this time on the biosynthesis of vitamin B<sub>12</sub>, folic acid, and purine and pyrimidine nucleotides and on their biosynthetic inhibitors in microorganisms, which led to many acknowledged first publications. Your early work with bacteria founded your love for microbiology. Even as your later work concentrated completely on photosynthesis in chloroplasts and you held the chair in Plant Biochemistry at Ruhr University, time and again you accepted microbiologists as Associate Professors into your department and encouraged them, e.g., Karlheinz Altendorf (1978–1982) and Rudolf Thauer (1972–1976).

In the laboratory of F. Weygand at the Technical University in Berlin, you had the task in 1955 of carrying out experiments for Otto Warburg at the Max Planck Institute for Cell Chemistry in Berlin. In the Warburg institute at that time, you became acquainted with Daniel Arnon, the discoverer of photophosphorylation, who offered you to join him at Berkeley. Thus, you relocated in the autumn of 1956 to the USA, where you stayed for two years and where you became a photosynthesis researcher. In 1958, your first pioneering work, together with Arnon, appeared in the journal *Nature*, in which it was shown for the first time that oxygenic photosynthesis proceeds in two phases:

in a light phase, in which NADPH and ATP are formed; and in a dark phase, in which CO<sub>2</sub> is fixed in an ATP- and NADPH-dependent reaction. The experiment, which was equally convincing and straightforward, is known as the Trebst-Tsujimoto-Arnon experiment in the literature and even in the textbooks for schools. Only a short time later, you described, likewise in *Nature*, that CO<sub>2</sub> reduction in the phototrophic gamma-proteobacterium *Chromatium* is also not light dependent as long as cell extracts are supplemented with ATP and H<sub>2</sub>. Analyses of photosynthesis in *Chlorobium* and by isolated chloroplasts, during your time at Berkeley, led to four further publications, which contributed substantially to our current view of photosynthesis.

While you were in the USA, your doctoral adviser F. Weygand moved from Berlin to Munich. You joined him there in 1959 to work as an assistant until 1963 and to complete your *habilitation* (postdoctoral qualification for professorship). During this time, the first experiments on photorespiration, the role of plastoquinone in photosynthetic electron transport (together with Herbert Eck), and light-dependent NADP reduction with artificial electron donors in chloroplasts were carried out. You recognized the central role of plastoquinone in cyclic and noncyclic photophosphorylation and laid the foundation for the clarification of its function, which occupies your time experimentally to this very day, as shown by your recently published (2008) article entitled “Plastoquinol as a singlet oxygen scavenger in photosystem II”.

But we have jumped 45 years ahead. Let us return to the original timeline. In 1963, you were offered an associate professorship for Plant Biochemistry in Göttingen, where you stayed until mid-1967. You then took over the chair for Plant Biochemistry at the newly founded Ruhr University in Bochum, which you held until you were conferred emeritus status in 1994 and where you still today head a small emeritus group funded by the DFG (German Research Foundation) within the framework of SFB (Collaborative Research Centre) 480. The time in Göttingen is characterized by experiments, among others, to find inhibitors of photosynthetic electron transport in chloroplasts, which can be used to gain insights into the role of the components, especially plastoquinone, involved in electron transport and phosphorylation. In cooperation with other scientists, you analyzed herbicides of the benzimidazole, carbamate, and 1,2,4-triazinone type as well as antibodies against chloroplasts, among them with Karl-Heinz Büchel, Wilfried Draber and Carl Fedtke from the Bayer Company, with whom you had a close cooperation for nearly 30 years. But it was first with 2,5-dibromo-3-methyl-6-isopropyl-*p*-benzoquinone (DBMIB) that you in 1970, then already in Bochum, found a new inhibitor that proved to be a specific plastoquinone antagonist, which allowed far-reaching mechanistic conclusions.

In your laboratory in Bochum, it became possible to analyze in detail the electron transport between photosystems II and I and the components involved using DBMIB and other specific inhibitors of photosynthesis. Experiments with quinoid, lipid-soluble and H-carrying electron donors led to the concept of “artificial energy conservation” which contributed significantly to the understanding of chemiosmotic energy conservation. Your laboratory was able to make important contributions especially to the structure of the protein involved in the herbicide binding pocket. Your work in 1986 on the topology of the plastoquinone- and herbicide-binding D1 proteins in photosystem II and your report in 1984 on the sequence homology of cytochrome *b* in *bc*<sub>1</sub> complexes from mitochondria and of cytochrome *b* in the *b<sub>6</sub>f* complex of chloroplasts are among your most-often cited publications. In 1990, you found that the herbicide-binding D1 protein is degraded by UV irradiation of chloroplasts in an oxygen-dependent reaction, and later, in 2002, you showed that singlet oxygen plays an important role in this reaction—a role that still today stimulates you to do further experiments.

In your department in Bochum, you always had group members who were allowed to pursue their own research direction after initial experiments with you, and who—after completion of their *habilitation*—became professors either in Bochum or at another German university. These were Peter Böger (Konstanz), Richard Berzborn (Bochum), Erich Elstner (Munich), Günther Hauska (Regensburg), Hermann Bothe (Köln), Günther F. Wildner (Bochum), Wolfgang Haehnel (Freiburg), Walter Oettmeier (Bochum), Jens-Dirk Schwenn (Bochum) and Udo Johannigmeier (Halle). You always generously supported all these former group members and let them work independently. Your encouragement and constructive criticism gave them the courage to forge ahead on their own. This was not restricted to the ten “Habilitanden” mentioned above. Numerous of your graduate students, postdocs and guest scientists decided to stay in science when they left Bochum and are now professors. To name only a few: Ahlert Schmidt (Munich), Herbert Böhme (Bonn), Wolfgang Lockau (Berlin), Thomas Happe (Bochum) and Prafullachandra Vishnu (Raj) Sane (Lucknow, India). Even one of your former technicians, Elfriede Pistorius, who worked for many years together with you, became so excited about science that she left your laboratory to study biology with the result that she became a professor for Molecular Cell Physiology at the University of Bielefeld.

Your academic students and colleagues admire you for your unerring analytical intellect, with which you always straightaway arrive at the critical point in discussions. To listen to you and to debate science with you is exceedingly enjoyable, which is why you have been and still are invited over and over again to hold seminars worldwide. You were



**Fig. 1** Achim Trebst, in 2001, during a lecture at the Purdue University, West Lafayette, IN, USA. Host: William A. Cramer

and are a beloved guest at many institutes throughout the world, which is mirrored in the invitations for research sabbaticals of several months from colleagues in Sweden (Bertil Andersson), the USA (William A. Cramer, Purdue University), and Israel (Itzhak Ohad, Hebrew University; Sammy Boussiba, Ben-Gurion University; Shmuel Malkin and Marvin Edelman, Weizmann Institute). In Israel alone, you were on sabbatical five times. Since 1990, you have

been the Erna and Jakob Michael Professor at the Weizmann Institute in Rehovoth. Figure 1 shows your photograph delivering a lecture at Purdue University.

Alongside your research, you have served in the scientific self-administration. For example, you held the position of a Dean three times and were active in countless review committees. You took on these responsibilities with insight and foresight.

Your multifaceted achievements and interactions did not remain without honours. For instance, you have been awarded honorary doctorate from the Stockholm University in Sweden (1990), from the Purdue University in the USA (1991), and from the University of Düsseldorf in Germany (1999). In 2007, you were invited to deliver the Daniel I. Arnon Lecture at University of California Berkeley (USA) and thereby became one of the immortals of photosynthesis research.

In the congratulations on this day in your honour, we would like to also include your dear wife, your four children and children-in-law, and your grandchildren. We wish you a happy life.

Sincerely Yours,

Volker ter Meulen (President German Academy of Sciences Leopoldina)

Rudolf (Rolf) Thauer (Marburg)

**Open Access** This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.